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EDITORS' OUTLOOK

The outlook for a National Journal of Chemical Education is largely determined by the circumstances which have given it birth, and by the manner in which it is expected to function.

This Journal has been an outgrowth of the Section of Chemical Education of the American Chemical Society. This Section, which was organized two years ago last fall at the New York Meeting of the Society, was the first definite step taken to form a National organization of chemistry teachers. The members of the Section now number 1000 and there are indications of a rapid increase.

During the growth of the Section there has been an increasing number of important papers given at the semi-annual meetings. The Editors of our regular journals have been most considerate toward the publication of these papers, but the very nature of these Journals together with their crowded conditions has permitted the publication of only a limited number. Similar conditions have been met when the papers have been presented to other journals such as the Science, School Science and Mathematics, etc. This accumulation of papers, in the face of these limited publishing facilities, made the demand for a medium devoted exclusively to Chemical Education so insistant that the Journal has been started.

However, it was not started until it had been learned by a letter ballot that a majority of the members of the Section favored such a project, and

until all actions taken by the Section were approved by the Executive Committee of the Council of the Society. Its financial responsibility has been assured for the first year by the prompt and cooperative action of the members of the Section. This unity of action is the greatest surety of its continued success.

There are many functions for a Journal of Chemical Education, but perhaps the following four are the most important:

1. To act as a medium for bringing before chemistry teachers the timely papers given before the Division of Chemical Education of the American Chemical Society and other valuable papers of like nature and thereby conserve any worthwhile work done in Chemical Education.
2. To encourage community of effort in any instituted reforms, furnishing a medium through which significant reports, studies, and experiments will be given wide circulation.
3. To encourage sufficient research among the teachers so that the proper investigational atmosphere may prevail in our class rooms.
4. To keep the teacher and student in closer touch with current opportunity furnished by the American Chemical Society and other scientific organizations and institutions.

In keeping with the above named functions, careful plans have been worked out to take care of papers offered for publication, in as prompt a manner as possible.

Any author who wishes to have his paper published will send it to the nearest contributing editor whom he feels best qualified to judge it. The contributing editor will read the paper, approve or disapprove it and then forward it to the proper departmental editor. The departmental editor will review the paper, put his approval or non-approval on it and forward it to the editor-in-chief. If the paper has been approved by both the contributing editor and the departmental editor the editor-in-chief will notify the author that his paper has been accepted for publication. If both have voted against it, the editor-in-chief will give notification of its non-acceptance. If only one of the first two editors have approved it the editor-in-chief must pass upon it before its acceptance or rejection.

It is hoped that the chemistry teachers may glean from the above that this Journal is their property, and hence criticisms, both pro and con, are earnestly requested by editors in order that each succeeding issue may contain many improvements.

N. E. G.

EDUCATING EVERYBODY

EDWIN E. SLOSSON, DIRECTOR OF SCIENCE SERVICE, WASHINTON, D. C.

New ideas explode like T N T and shatter the confining walls.

Science has produced so many new ideas in recent years that they have burst through the walls of school room and laboratory and escaped into the open.

No professor can now maintain a monopoly of his own profession. He will often meet with men who know as much as he does about his science and yet have no title in front of their names nor degrees trailing after them. Day by day in every way it is getting harder and harder for the teacher to keep ahead of his students. More and more the students are learning science out of school. I fancy it would have taken many years for the new theories of electricity to have been incorporated into the common mind if the radio had not come along to help out the teacher. But now we have kids talking about electron streams and metric wave lengths as they skate along the streets. And they know what they are talking about as they can demonstrate by making radio receivers that work.

I fancy more physics has been taught to the present generation by the automobile than by the professors. The automobile is autocratic in its methods. It has the habit of stopping suddenly in the middle of the highway or on a railroad crossing and giving the chauffeur a quiz on the chemistry of combustion or the laws of mechanics. And the chauffeur is not allowed to pass until he has given a practical demonstration of his knowledge. Seventy per cent of book learning will not suffice.

This spread of science to the outside world is scary to the teacher who is secretly unsure of his own knowledge and therefore prefers to cling closely to his textbook. But the competent and confident teacher will welcome the new opportunities it offers for extending his influence outside his class room and awakening more interest within. We are yearly losing many of our young people, and among them some of the most active and intelligent, because they fail to see the connection between school work and life work and so drop out at various stages to take up what they consider more practical affairs. Later in life they may repent of leaving and wish they had stayed longer in school but they cannot retrace their steps and take the other turn.

Teachers in literature, history, geography, and political science have recently been able to counteract this tendency by bringing newspapers and periodicals into the class room and so showing that what they were teaching was not something dead and gone, but a vital part of the stream of thought and action in the world today. There is an abundance of material in the popular press that can be so employed to revivify and bring up to date the textbook teaching in these subjects.

But the science teacher has not been so well supplied with such aids, for the newspapers and popular periodicals do not give as much attention

to science as its important modern life deserves, and what they print is not always as accurate as it might be. The faithful reader of any one of our first-class newspapers or of any of half a dozen periodicals could get an adequate idea of the course of events, the tendency of commerce, and finance, the drift of political opinion, and the trend of art, drama and literature. But he could not get so complete, comprehensive or correct an idea of the progress of modern science. For this the general reader must see the technical or popular science periodicals and as a rule he does not take the trouble.

It was the purpose of making science more accessible to everybody that Science Service was established in Washington three years ago. Through the generosity of Mr. E. W. Scripps, who as a verteran newspaper publisher had realized the need of having authoritative and up-to-date information at hand for editorial use, funds were provided for starting this new and unique institution. It is placed under the control of the three national societies of general science, the American Association for the Advancement of Science, the National Academy of Sciences and the National Research Council. Eleven of its fifteen trustees are prominent scientists and the rest are practical journalists. Science Service is chartered as a non-profit-making, non-partisan and non-propaganda organization with the sole aim of reaching the largest possible number of people with the largest possible amount of scientific information.

Since the newspapers reach the most readers, we have devoted our primary attention to supplying the daily press with brief news articles in non-technical language. This work is well established and our Daily Science News Bulletin is now syndicated to a chain of papers, one in each city, which subscribe for it as they do for the Associated Press dispatches. Although Science Service is a philanthropic institution, it is not a charitable concern. Its material may be sold at less than cost but is not supplied free. The Bulletin is sent out in the form of mimeographed sheets, each day's issue containing three or four articles on various scientific subjects, about a thousand words in all. Out of this came an unexpected development. Librarians in college, industrial and public libraries wanted these sheets to tack up on their bulletin boards to arouse interst in current science and to answer questions asked them by their patrons. Certain enterprising teachers asked for copies for class use and reported that they worked wonders in waking up their students to a realization of the importance of science.

But this put us in an embarrassing situation. We could not afford to supply them free nor could a teacher afford to pay $10 or $20 a week like a paper which used it for press copy. So we solved the difficulty by running off a special weekly edition for schools and libraries with the addition of references for further reading, book reviews and other features. This is called the "Science News Letter" and since it is not for publication, it is supplied to schools, libraries and individuals at $5, which about pays for

its cost. Some teachers subscribe at reduced rates for enough copies to give one to each student. In the summer school of Teachers' College of Columbia University, one class took a hundred copies.

In talking with teachers in various parts of the country I found that they wanted scientific books of a sort that their students would read voluntarily outside of study hours. A start has been made to meet this need in "The Young People's Shelf of Science" which I am editing for the Macmillan Company. Two volumes are just out, "Everyday Mysteries" by Dr. C. G. Abbott of the Smithsonian Institution, and "Dwellers of the Sea and Shore" by William Crawder. In this series I have deliberately disregarded the scholastic divisions of the several sciences and mixed them—as they are actually mixed up in nature.

Another effort to aid the science teacher has been made by Dr. Caldwell and myself in the volume called "Science Remaking The World," just published by Doubleday, Page & Co. This contains sixteen chapters by as many different authors on scientific progress in various fields. A copy of this volume will be sent free, so long as the supply holds out, to the library of any high school or normal school applying for it to Dr. Otis W. Caldwell, Director of the Lincoln School, Teachers College, Columbia University, New York.

We have many other plans in mind for providing reading matter that will reinforce outside the class room what the teacher is doing within. It would help us greatly in our efforts to help the teacher if he would tell us what he most needs. What could we put into your local paper that your pupils would cut out and bring in to your class room as his contribution to the topic under discussion? How can we increase the living links between the school and outside world?

May I remind the chemists in conclusion that we have more difficulty in getting "good" copy in chemistry than in any other science. We can get any number of interesting "stories" about stars and stones, about clouds and complexes, about insects and Indians, but there is a strange dearth of writers on chemistry, although there is, as we realize, no subject that touches human life at more points, none that has a longer or more romantic history, none that is making greater progress at present, or that promises more for the future.

WHAT WE TEACH OUR FRESHMEN IN CHEMISTRY

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UNIVERSITY OF IOWA, IOWA CITY, IOWA

With all that has been said about what should be taught in courses in freshmen chemistry, a *knowledge of what is now being taught* would seem desirable as a basis for discussing changes. The authors have attempted such a formulation in the present study. The data set forth below were

based on information arising from a questionnaire sent, early in 1923 to the 27 Institutions listed in Table V. Three kinds of data are considered.

1. Results of teachers experience as expressed in questionnaire answers.
2. Content of most widely used texts.
3. Content of final examination questions.

The authors have also made a similar study of the content of courses in High School Chemistry. Toward the end of the paper the content of High School and College Chemistry are graphically contrasted.

In Table V, are tabulated the answers teachers made to questionnaire questions.

TABLE V. DATA FROM QUESTIONNAIRES FROM 27 COLLEGES AND UNIVERSITIES

Institution	No. Students	Text Used	Stress Theory, Facts, Both?	Do we teach too much?	Use Electron Concepts?	Early in Course?
1. Ames (Iowa)	1200	Mc P&H	Theory	Yes	Yes	Yes
2. Arkansas	250	Mc P&H	Both	Yes	Yes	No
3. California	800	Hild	Theory	Yes	Yes	Yes
4. Chicago	150	Smith	Theory	..	Yes	Yes
	150	McC & T	Both	..	Yes	Yes
5. Columbia	400	Smith	Facts	Yes	Yes	Yes
6. Cornell	1100	Mc P&H	Facts	Yes	Yes	No
7. Harvard	400	Smith	Theory	No	Yes	After
		Mc P&H				3 mos.
8. Illinois	1300	Noyes	Both	Yes	No	..
9. Iowa U	600	Smith	Both	Yes	No	..
10. Louisiana S U	300	Mc P&H	Theory	Yes	Yes	Yes
11. Mass. Inst. Tech.	600	Norris	Both	No	Yes	Yes
12. Michigan	900	Smith	Both	No	Yes	No
13. Minnesota	1300	Mc P&H	Both	Yes	Yes	Yes
14. Missouri	600	Holmes	Theory	Yes	Yes	No
15. Nebraska	400	Mc P&H	Both	No	Yes	No
16. Oberlin	200	Holmes	Theory	Yes	Yes	Yes
17. Ohio State U	1400	Mc P&H	Both	Yes	Yes	No
18. Oregon Ag.	700	Mc P&H	Both	No	No	No
19. Oregon U	200	Holmes	Both	Yes	No	..
20. Purdue	1000	Holmes	Both	No	No	..
21. Stanford	300	Holmes	Theory	Yes	Yes	No
22. Syracuse	600	Mc P&H	Theory	No	No	..
23. Univ. of Wn.	550	Smith	Theory	Yes	Yes	No
24. Washington St.	400	Newell	Theory	..	Yes	No
25. W. Virginia	500	Norris	Theory	Yes	Yes	Yes
26. Wisconsin	1200	Mc P&H	Both	Yes	No	..
27. Yale	600	Holmes	Theory	Yes	Yes	Yes
Totals	18100		Theory 13 Fact 2 Both 3	Yes 18 No 7	Yes 20 No 7	Yes 12 No 10

In Table VI, the data of Table V are graphically summarized. Table VI also contains a page by page analysis of the three texts most widely used in the colleges and universities represented.

SUMMARY OF CONTENT TEXTS AND TEACHERS STRESS

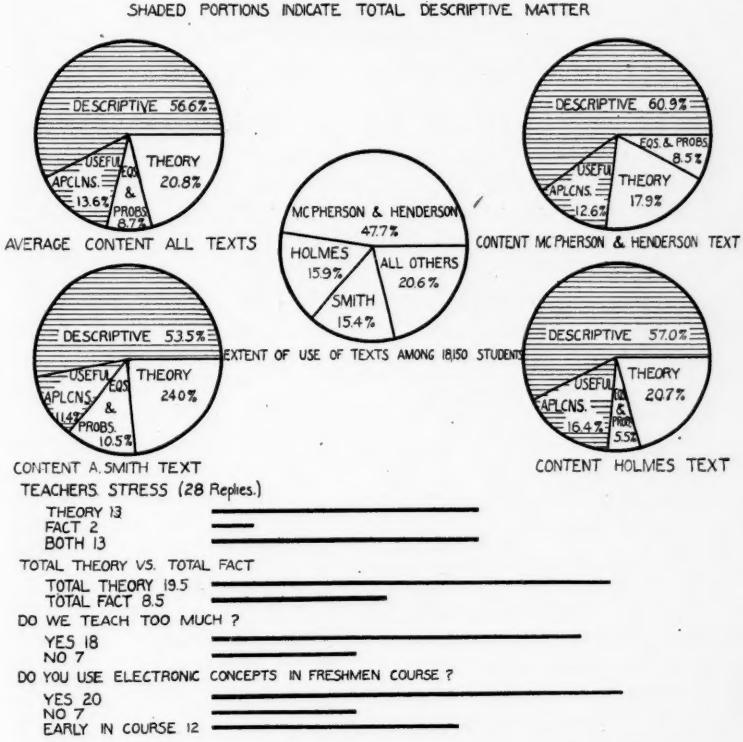


Table VI

It is here shown that 18,100 persons are taking freshmen chemistry in the 27 institutions represented. While eight different texts are used, 79% of the students and 85% of the institutions use but three different texts.

It is probable that the analysis of texts might vary with the person making the analysis, but it is improbable that there should be any great modification of the total average proportion of 70% descriptive to 30% theoretical matter. Perhaps the most salient feature regarding texts is their close agreement in content, of almost equal significance, the fact that so few texts are so widely used.

In the compilation of data concerning what teachers say they stress, it was quite apparent that what some teachers called theory others considered fact. However the replies are recorded as received. Two teachers stress facts, 13 stress theory and 13 theory and fact equal emphasis. A numerical value for the total stress given to theory and fact is obtained by an equal division of between the votes for theory and fact of the thirteen votes of "Both." The vote then stands Theory $19\frac{1}{2}$—Fact $8\frac{1}{2}$ or on a percentage basis, Theory 69.7%—Fact 30.3%. This is almost an exact reversal of the corresponding figures representing the content of textbooks.

The score of 18 to 7 affirming that we try to teach too much indicates wide spread dissatisfaction with the thoroughness at present secured. These figures along with private correspondence in connection with this study indicates that large numbers of teachers desire to cut down the quantity of subject matter presented in their courses.

The data concerning electrons represents a rough attempt to gain some indication of the extent to which some of the comparatively recent developments of the science are incorporated in the subject matter of ele-

TABLE VII. ANALYSIS OF 1834 FINAL EXAMINATION QUESTIONS RECEIVED FROM INSTITUTIONS LISTED BELOW

Institution	No Qst Sent	Descpt	Usfl Apclns	Eqns and Probs	Theory
1. Ames (Iowa)	508	26.7%	10.6%	22.0%	40.9%
2. Arkansas	86	31.4	29.0	19.8	19.4
3. California	26	19.2	3.8	57.8	19.2
4. Columbia	21	23.8	14.3	33.3	28.6
5. Cornell	52	30.8	23.1	25.0	21.2
6. Harvard	99	34.3	25.2	22.2	18.2
7. Illinois	116	25.0	12.0	47.4	20.6
8. Iowa U	52	28.8	1.9	44.2	25.0
9. Mass. Inst. Tech.	10	10.0	20.0	70.0	00.0
10. Michigan	50	30.0	6.0	30.0	34.0
11. Minnesota	182	23.0	14.8	33.0	29.2
12. Missouri	95	32.6	9.5	37.9	20.0
13. Oberlin	20	25.0	10.0	45.0	20.0
14. Ohio State U	112	34.8	6.3	25.9	33.3
15. Oregon Ag.	84	28.6	21.4	31.0	19.0
16. Purdue	48	29.0	12.0	31.0	27.0
17. Syracuse	9	00.0	11.1	55.5	33.3
18. Univ. of Wn.	33	33.3	15.2	9.1	42.4
19. Washington St.	95	26.0	7.0	32.0	34.0
20. W. Virginia	69	26.1	13.0	36.2	24.7
21. Wisconsin	42	33.3	9.5	52.3	4.0
22. Yale	25	32.0	28.0	36.0	4.0
Totals and Av.	1834	26.3%	13.8%	36.2%	23.5%

Figures underlined are greatest and least in each column.

Chicago, Louisiana State, Nebraska, Oregon U, and Stanford Universities supplied questionnaires but not examination questions.

mentary courses. About one third of the teachers report the entire exclusion of electrons from their instruction, while less than half use electronic concepts early in their courses. Certainly, undignified haste is not to be numbered among the sins of teachers of elementary chemistry.

Analysis of Final Examination Questions

Whatever text may be used, and whatever teachers may stress in instruction, final examination questions play a prominent if not dominant role in evaluating student attainment. By the route of student tradition and files of old examination questions handled from one student generation to the next, these final examination questions set the goal of student effort, to a degree teachers little dream of. Finally it seems probable that the content of final examination questions express more certainly than information from any other source just what ideas constitute the irreducible minimum of chemical knowledge a student must possess to pass the course, consequently they would appear to set out the ideas which teachers deem most basic.

For institutions sending 50 or more questions the deviations are surprisingly narrow. Weighting the figures for the number of students represented or the questions submitted does not materially modify these averages.

If the figures for each institution be appropriately grouped under the two headings "Total Descriptive" and "Total Theory" and the resulting totals compared with what the respective teachers in the questionnaires say they stress that some sharp inconsistencies are indicated. It is here suggested to interested teachers that they, in the quiet of their studies, write out a quantitative statement of their aims and then check this statement against an analysis of all their final examination questions for the past three years. We sincerely hope the outcome will be satisfactory. Of course the assumption is held that the content of final examinations should approximate that of previous instruction.

Table VIII shows that from a fourth to a half of all final examination questions deal with chemical arithmetic and equation writing. We believe this signifies that, consciously or unconsciously, most teachers feel the basic inportance of the kinetic concept of matter in its various ramifications and that no student can gain a true understanding of chemistry till he can think in terms of atoms and molecules and can express and interpret these concepts in chemical equations.

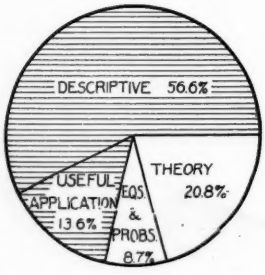
A further fact not indicated by the table but gained from its compilation is that the similarity between sets of questions from a majority of institutions is so great that they could be freely interchanged for purposes of final examination without undue hardship to students involved.

Summary of Items Directly Deduced from Foregoing Data

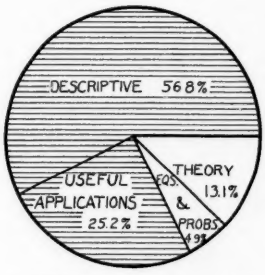
1. Only three texts, similar in content, are used by 79% of the students and 85% of the institutions represented.

CONTRAST OF CONTENT HIGH SCHOOL AND COLLEGE CHEMISTRY

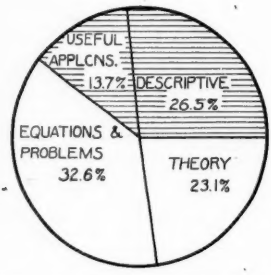
SHADED PORTIONS INDICATE TOTAL DESCRIPTIVE MATTER



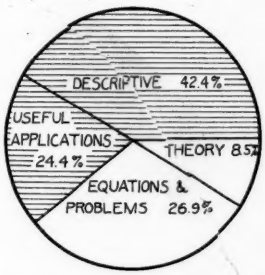
CONTENT OF COLLEGE TEXTS



CONTENT OF HIGH SCHOOL TEXTS



CONTENT COLLEGE FINAL EXAMINATION QUESTIONS



HIGH SCHOOL FINAL EXAMINATION QUESTIONS

Table VIII

2. Of the 28 teachers represented, 13 say they stress theory, 2 stress facts, and 13 give theory and fact equal stress. On a percentage basis teachers stress is 70% theory and 30% fact.

3. 72% of the teachers believe we try to teach too much, which indicates that courses are over-burdened with subject matter and that there exists a wide spread dissatisfaction with the thoroughness of results now obtained.

4. The answers to the "electron" questions indicate reluctance to

incorporate recent advances, in the subject matter presented in elementary courses. Possibly the present plethora of subject matter above indicated in part accounts for this reluctance.

5. Great similarity exists among final examination questions asked at a majority of Institutions.

6. In many instances there is sharp contradiction indicated between what teachers say they stress and the stress in corresponding final examinations. This indicates either that some teachers do not practice in their examinations what they preach in previous instruction or else a lack in clarity of objectives.

7. *College chemistry is strikingly unlike most High School chemistry* in that it is much more theoretical. We do not believe the mental capacity of High School students is such as to necessitate this avoidance of the fundamentals. We wonder if a comparison of the number of teachers of High School chemistry who have had courses in physical chemistry with those who have not had such courses would throw light on the matter. Lacking such data an opinion is withheld.

8. In the proportion of theory contained in final examination questions, those of the New York State Regents, come lowest with 6.7% the average for all High Schools next with 8.5%, the Entrance Board next with 12.4%, and the colleges highest with an average of 23.5%. This is more than three times as great as the Regents questions.

Comment and Suggestions Arising from This Data

1. The aim in present texts and in much instruction represents a compromise between the largely descriptive chemistry of a few decades ago and the ideas of physical chemistry which have been incorporated in elementary courses during the past 20 to 25 years. The result is an enclyclopoedic hodge of the old and new, too extensive for thorough treatment in the time usually alloted, and so rich in multiplicity of slightly related details as to bewilder the earnest student. Clearly a pruning process is desirable.

2. While an entire paper could be evolved from the final examination questions collected, we wish to offer the following as being pertinent.

a. Questions should be objective. It should be unnecessary for students to guess what the teacher had in mind in order to correctly answer. Questions should be such that a dozen different competent readers could independently grade a set of papers and arrive at approximately the same marks. Questions such as "Discuss the periodic table." or "Give a brief history of chemistry," do not come in this category.

b. Where possible questions should be worded so that the answer is an act of reason and understanding rather than an act of mere memory. For example, answering "State Boyles Law," is an act of memory, while answering "If the temperature is kept constant how does the volume

of a given quantity of gas change when the pressure is doubled?" is more an act of understanding and reason.

c. Ask many questions requiring short answers rather than few requiring long answers. Many sets of questions contained only 3 to 5 rather highly specialized questions. A student might by missing one or two of these receive a low mark and still have a fair knowledge of the entire subject matter covered.

d. It seems superfluous to state that the contents and stress of final examination questions should approximate that of previous instruction.

e. The so-called "intelligence test" type of final examination is coming into use. Where carefully composed these examinations are excellent in thoroughly covering much subject matter in a short time. But when hurriedly or carelessly composed they are apt to be inane and the resulting answers meaningless.

f. Questions involving the theory and application of electricity and of energy influences in producing chemical change are almost non-existent. On both theoretical and practical grounds this exclusion seems regrettable. Perhaps this is another result of overcrowded courses.

We believe application of the foregoing suggestions, where apropos, would help in making work more thorough and in getting better correlation between final marks and intelligence test ratings. While care and skill in formulation and administration of courses will help, it is doubtful if satisfactory thoroughness can be generally obtained so long as many students of high intelligence do not wish to learn and so many of low intelligence cannot.

In conclusion we wish to thank the many teachers in both High Schools and Colleges, for their help in making this paper possible and to offer our apologies to any whom we have unwittingly misrepresented or misquoted.

THE RESPONSE OF HIGH SCHOOL PUPILS TO CHEMICAL EDUCATION

HERBERT R. SMITH, LAKE VIEW HIGH SCHOOL, CHICAGO, ILL.

Anyone who has a moderate amount of chemical knowledge knows what chemistry has contributed to human progress and also what it is able to do further, in this line. Since only a small minority of our population has such knowledge, it is easy to believe that human progress is waiting for a better knowledge of things chemical in our plan of education. The individual is most impressionable in youth and has his life-time before him to use what has been taught, so the teaching of chemistry in the high school is extremely important and ought to be done well if done at all.

The average high school pupil of today is a well-intentioned youth of 15 or 16, well-fed and well-clothed, and with an abundance of opportunity for education and success in life's work. But his acceptance of the mate-

rials at hand and his response to the opportunities offered him are well below the 50% mark. In no less numbers than formerly are the earnest capable students found in the high school who become college students and achieve distinction. But fully three-fourths of the high school pupils are of another type. They could attain a high standing in education, but the fact remains, they do not. The compelling circumstances are wanting in their environment. It may be said that they do not care for education, but in a sense this is not true. They admit and know the value of education, but do not have the will power to give up amusements for study. And few parents are giving their children real assistance in this matter. Two or three decades ago pupils who went to high school did so because they were interested in things intellectual and were willing to work hard for an education. Now, compulsory laws make many go to high school even if they have no desire for mental training. They are eager for the social diversions of the school, but will not study except under pressure in school and not at all when out of school. In the largest cities the high school enrollment has outstripped the building program. Chicago frankly admits that it cannot erect the buildings to accommodate pupils under the single session plan. Most of its high schools are now run on the double shift plan with the result that pupils are not making progress in education from lack of study. We find that these conditions of modern life have a tendency to bring about a steady deterioration in the education of the average high school student.

The only direct method of remedying this situation is to improve the methods used, and this practically means the teacher. Methods in education have not changed to meet the rapidly changing conditions of modern life. The amusement world has grown enormously, and the school in competition for the time and attention of the pupil is far behind as an attraction. Teachers follow the classic paths marked out by predecessors, while the amusement world offers almost a new path every day for youthful feet to tread. Now, education can be made more attractive and still be dignified. It is not at all necessary to cater to the whims of pupils, but if teaching is to be effective it must be taught *in terms of the subject's service to mankind*. Without contact with life the subject becomes dead to the pupil. And so far as the subject of chemistry is unattractive in the high school, just so far is it taught in a bookish, useless way. The pursuit of chemistry involves just as much daring as any adventure and its quest as many thrills as any Sherlock Holmes ever discovered, and all that remains is for teachers to impart chemical information in a vivid and dramatic manner, and there will be an enthusiastic response even from children. Not long ago one of my pupils of moderate ability entered Northwestern University. Later when he visited me at Lake View I found his enthusiasm for chemistry much intensified. Speaking of his professor he said, "He shows you what chemistry is good for." You who know the personal qualities of Prof. Lewis of Northwestern will understand the reason for the

student's enthusiasm. Among modern teachers of chemistry the late Alexander Smith ranked with the foremost. It was my good fortune at one time to be a member of one of his classes. There were few dull moments, while in class for his peculiar piquant way of stating a question attracted and held ones attention, yet we never felt that we were being quizzed. A delightful informality pervaded the class discussions, when as it were, he was one among us and we talked to him as one of us rather than as a teacher. It is always dangerous to condescend but he never did that, he was just human. But how I wish that some geni had whispered to him to write his books in the same human companionable spirit as he taught, so that this spirit might still go among us making new friends. It is no criticism to say that it is only Alexander Smith, the scholar, and not the teacher that lives in the books that he wrote. All too many college students do I know who know only Alexander Smith, the scholar. They have respect for him but little admiration. It was the fine privilege of their college professors to make the word flesh and dwell among them, but they did it not. Distance and so-called dignity of teachers make the twin evil of pupil don't-careness to prevent education. Some of you know and possibly admire certain qualities of the elder Ostwald. I know him to be an effective teacher solely from the charming "Conversations in Chemistry" that he wrote. While lesser teachers were writing treatises he was writing *just* conversations.

It may be too much to ask every teacher to be inspiring to pupils. Still we may save the cause for the pupil if we can put in his hands a book written in an inspiring way. If a pupil begins to read a book about chemistry and takes time from it only to eat and reads it far into the night, and the next day announces that he is going to be a chemist, you will know that there is something inspiring and compelling in the book. Such was the influence of Duncan's Chemistry of Commerce on a pupil of mine. Since the passing of Dr. Duncan we are fortunate in finding another in the author of Creative Chemistry who is able to wield the same effective pen. The distribution of thousands of copies of Dr. Slosson's book among the business men of America was an expenditure of funds that will bring big returns to the American Chemical Society. In a textbook of college chemistry that recently came to my desk I find that Dr. Holmes of Oberlin College actually dares to explain the condition of equilibrium in terms of the usual freshman-sophmore fracas. The illustration does not suffer in dignity and it does add a human touch to cold science. Scientists may at times be cold calculating machines but they will not be appreciated by pupils and mankind in general until they are at least sometimes warmly human. The first line of the preface of this book begins thus: "This book has been written from the standpoint of the student"—Dr. Holmes first desires to get the confidence of his students so it may well be expected that they are interested and appreciative.

The first book written for high schools by the two well known professors

of Ohio State University was just chemistry and little about its uses. The last one bore this title. "Chemistry and its Uses," and I am sure that we of the high school, pupils and teachers, think it a far better book. I venture to predict that if they will try again, and take the title: "The Uses of Chemistry," we will have the one which we need. Our assurance on this point rests on this experience. After getting our classes nicely started in chemistry with enthusiasm growing at a fair rate, we have seen it wither and die in a few hours under the influence of the experiment, "To determine the concentration of an unknown solution by titration." Those who obtain a poor result make this appeal: "Do I have to do it again?" The principle of the experiment is important but the pupil does not see it. This is how we make the procedure humanistic. The pupils bring bottles of vinegar or household ammonia obtained from the grocer. After reading the alluring labels of "extra strong" and "triple strength" we start to find the truth of the matter by titration. The difference in interest is astonishing. A minimum of three trials are required but most pupils voluntarily do more. A boy on his twelfth trial responded to inquiry: "I want to be sure that it is right and it is fun anyway." One slow pupil after running the gamut of the ideas, endpoint, indicator, normal solution, etc., confidentially confessed that this was one experiment that he really understood. This year one of the girls analyzed a certain brand of ammonia, and happened to be in the grocery store while the salesman was taking an order from the grocer. She asked him what percent of ammonia this brand contained. He evidently did not know and decided to take a chance on noting her youth. He assured her that it was fully 75%. (You know that the highest concentration that we purchase is just under 30%.) The look of triumph on her face will be long remembered as she recounted how she told the salesman that his brand analyzed 2.3% and how she had done it. She is a friend of chemistry for life now. These incidents reveal very nicely the temper of our American youth. Discipline as discipline alone will not be accepted. But they will endure drill and discipline if they understand its purpose. They will work, and work hard if they know the cause is worthy.

The construction of the Panama Canal surpassed any previous achievement of the human race. In doing the work we had the finest exhibition of the morale of workers that can be imagined. The inspiration of the workers was well shown in a little verse that one of them wrote while returning from the big job.

> "Got any rivers that are impassable?
> Got any mountains to tunnel through?
> We specialize in the wholly impossible,
> Doing what nobody else can do."

Our American youth will show the same spirit if their teachers will inspire them to do great things and show them how. I believe it is the mission of science and of chemistry in particular to furnish the inspiration

better than any other subject in the curriculum. But our high school teachers are out of contact with the service side of chemistry, and to use a commercial phrase they are salesmen trying to sell chemistry to our youth with little knowledge of its worth and power. The men of research and industry of the American Chemical Society are in actual contact with the working side of chemistry. I have visions of how they might furnish material from their work and experience to an educational committee to organize and distribute to teachers and the public in general. This material would be in the nature of stories of modern research and the efforts to disclose the secrets of Nature, accounts of the application of such discoveries to the service of mankind, bringing comforts, health, and happiness. What a load of suffering may be removed by the two recent products of science, insulin and intarvin! The Journal of Industrial and Engineering Chemistry has a wealth of material but it is locked up in technical phrase and is available only to those of extensive education and wide experience. Might not a journal be written in more simple phrase for the secondary teachers, the pupils, and the public? Is it not more logical to interest the business man in chemistry in his high school days? I believe it possible for the American Chemical Society in one piece of work to further its own interests and at the same time those of secondary teachers and pupils and finally the general public.

WHAT KIND OF RESEARCH IS ESSENTIAL TO GOOD TEACHING?

W. A. Patrick, Johns Hopkins University, Baltimore, Md.

Will the general participation in original chemical investigation on the part of the instructors of chemistry in undergraduate colleges improve the standard of instruction?

It is my belief that the task of laying the accumulated knowledge of chemistry before his students is of sufficient magnitude to demand the entire strength and ability of any man. If we seek to improve the standard of chemical instruction by requiring the instructor to add to our store of knowledge by original investigation, as well as present to students the known facts with clearness and enthusiasm, then I fear that either poor teaching or poor investigation will result in the majority of cases.

The trouble at present is that the teacher is suffering from an inferiority complex. He sees the prizes in the hands of the "research men" and when he compares his work with that of the latter he finds that the teacher is usually at a disadvantage. The fruit of the teacher's work ripens slowly and is not so tangible as a research "paper" in a chemical journal. Furthermore the able teacher is often confused with the popular teacher. And again, due to a certain leniency that exists in our colleges, the competitive struggle is softened among the teachers, thus attracting men of a less

aggressive type into teaching. The remedy is to be found, not by requiring the teacher to show his worth as an investigator but by making him prove that he is a teacher and in insisting that the profession of teaching be given its proper recognition.

It is essential that the teacher do research work, i.e., he should comb the subject of chemistry from end to end for facts and for methods of exposition that will make such facts live and real to his students. The teacher's viewpoint of chemistry should be one of great breadth, not narrow as is necessarily that of the investigator. All dogma and display of authority should be avoided, while at the same time respect for the work of the masters must be obtained. Thus it is evident that the task of the teacher is truely Herculean, and that such work when well done is entitled to our highest material and social honors.

Local Activities and Opportunities

New England Association of Chemistry Teachers: The New England Association of Chemistry Teachers is an organization of Secondary School and College teachers of Chemistry in New England, having a membership of over 400. It was organized in 1898 with Dr. Lyman C. Newell as its first president. Since its reorganization in 1921, it has been operating in four divisions: The Central Division includes Eastern Massachusetts; the Southern Division, Southern Massachusetts and the State of Rhode Island; the Western Division, the State of Connecticut and Western Massachusetts; and the Northern Division, the States of New Hampshire, Maine and Vermont. Six meetings a year in its various divisions are now held, in the interests of chemistry teaching, and industrial excursions are arranged monthly in the Central Division.

On November 3rd the Association visited the new Metcalf Chemical Laboratory at Brown University, Providence, R. I. Following the annual reports of officers and standing committees, Professor Gorham W. Harris of Simmons College gave a talk on "Some Chemistry of the Insect World" and Dr. Simon of Brown, a paper on "Some Applications of Photochemistry." The meeting concluded with a series of lecture demonstrations by Professor Herbert F. Davison of Brown. Previous to the meeting, visiting members of the Association were shown about the new laboratory by the instructing staff of Brown.

The sixth regional meeting of the Western Division was held at Yale University on December 8th, being preceded by an industrial excursion through the Kolynos factory in New Haven. Several members of the New York Association were the guests of the Association on this occasion.

At the morning session Mr. Earl R. Glenn of the Teachers College, Columbia University, gave a paper on "Standard Tests in Chemistry," and a paper by Assistant Professor Henry S. Johnson of the University of Havana on the results of a questionnaire on the grading of a typical chemistry paper was presented. At the conclusion of the morning meeting the visiting members were the guests of Professor P. T. Walden at his regular college class. Professor Walden gave an illustrated lecture on "Colloids."

Following lunch at the Woolsey Hall Cafeteria, an afternoon session was held at which report of the work Committees of the Western Division were given. New work committees for the ensuing year were here elected and the meeting concluded by a practical talk on "Some Unusual Uses of Paper" by Mr. Burgess of New York City.

At the Brown meeting the annual election was held. The nominating committee consisted of Mr. Arthur H. Berry of the Providence Classical High School, Rhode Island; Professor Gorham W. Harris of Simmons College, Boston; Mr. Max Small of the New Haven High School, Connecticut; Professor Kraybill of New Hampshire University; Miss Charlotte E. Rogers of the East Providence, Rhode Island High School; and Mr. Raymond R. Thompson of Hebron Academy, Maine. The following are the officers elected for 1923–1924:

President: Mr. S. Walter Hoyt, Mechanical Arts High School, Boston.

Vice-President: Mr. J. Herbert Ward, Classical High School, Providence.

Secretary: Mr. Lawrence R. Atwood, High School, Malden, Mass.

Assistant Secretary: Miss Octavia Chapin, High School, Malden, Mass.

Treasurer: Mr. Alfred M. Butler, High School of Practical Arts, Boston.

Chairmen of Divisions:

Central: Miss Eva Ammidown, West Roxbury High School, Boston.

Southern: Professor Herbert F. Davison Brown University, Providence.

Western: Mr. Leslie O. Johnson, New Haven High School.

Northern: Mr. Myron E. Berry, Tilton School, Tilton, New Hampshire.

Three more meetings will be held in the coming winter and spring: one in March at Boston; and two in the month of May—one in the Western Division at Mount Holyoke College and one the second Saturday in May in New Hampshire. The meeting at Mount Holyoke will be a joint meeting with the Connecticut Valley Section of the American Chemical Society.

The N. E. A. C. T. issues a publication in which full reports of the proceedings are given, including the papers and addresses. This publication is sent to all members free of charge. A limited number of extra copies are available for distribution to non-members at thirty-five cents a copy and may be obtained by addressing the Secretary, Lawrence R. Atwood, Malden High School, Malden, Mass.

Maryland Association of Chemistry Teachers: During the Thanksgiving recess the Maryland Association of Chemistry Teachers was organized. The membership includes teachers in secondary schools, colleges, and universities, and provision is also made for admitting others who may have an active and intelligent interest in chemical education, even though they may be engaged in

technical work. It is planned to hold at least one general meeting a year for the discussion of papers and reports.

The function of the Association is significantly stated in the following article from the Constitution: "The purpose of this Association shall be the promotion of the teaching of chemistry. More specifically, the Association shall seek to accomplish this purpose by serving as a medium for the exchange of ideas on practical teaching problems, and as a means for keeping teachers in touch with the broader aspects of chemical education, particularly by affiliation with the Division of Chemical Education of the American Chemical Society."

At the organization meeting the Report on the Correlation of High School and College Chemistry (*Ind. and Eng. Chem.*, **15**, 1189 (1923)), was presented for study and criticism. The plans for this journal also were presented, and a number of subscriptions were obtained. These two matters alone would seem to indicate that there is a distinct need for such an association, and that the work of the Division of Chemical Education would be greatly facilitated if there were in each state a general association of teachers affiliated with the Division.

Phillips' Medalist in France: Russell L. Jenkins, who was awarded the Francis C. Phillips' medal of chemistry in the University of Pittsburgh in 1920, and who has for the past three years held a graduate fellowship at the University of Illinois, is at present in the laboratory of Professor V. Grignard, Institute de Chimie, Université de Lyon, Lyon, France, having obtained a scholarship to France on the strength of his record at the University of Illinois. Mr. Jenkins writes that Professor Grignard's laboratory is in a well equipped chemistry building, which occupies an entire city block. With Mr. Jenkins in Professor Grignard's private laboratory are five other students—three Frenchmen, a Russian and a Canadian. Mr. Jenkins is working on a new series of tetra-hydro-oxazoles, which are being prepared by an entirely new procedure.

California Institute of Technology: Professor Richard C. Tolman of the California Institute of Technology recently attended a joint session of the Board of Helium Engineers of the United States Bureau of Mines, with the Army-Navy Helium Board at Fort Worth, Texas. The purpose of this meeting was to investigate the operation of the semi-commercial plant designed by the Board of Helium Engineers. This plant run at a considerably overrated capacity, produced helium of 95% purity more efficiently and more cheaply than any method heretofore suggested.

University of Pittsburgh: Dr. Alexander Silverman, Head of Chemistry Department, University of Pittsburgh, has been elected chairman of the Pittsburgh Section of the American Chemical Society for 1924.

National Research Fellowships: The National Research Council in 1919 was entrusted by the Rockefeller Foundation with the expenditure of an appropriation of half a million dollars within a period of six years for promoting fundamental research in physics, chemistry amd mathematics primarily in educational institutions in the United States. Recently this grant has been renewed for a second period of five years and has been increased to $625,000.

The primary feature of the plan is the initiation and maintenance of a system of National Research Fellowships which are to be awarded by the National Research Council to persons who have demonstrated a high order of ability in research for the purpose of enabling them to conduct investigations at educational institutions which make adequate provision for effective prosecution of research in Physics, Chemistry and Mathematics. The results which are expected to follow are the benefit of a scientific career to a larger number of able investigators and their more thorough training in research, together with an increase of knowledge of the fundamental principles of Physics, Chemistry and Mathematics, and the creation of more favorable conditions for research in the educational institutions of this country.

These Fellowships are administered by a Board representative of the different sciences involved and are awarded after careful consideration to such as may be entitled to them. The fundamental requirements of an applicant are a Ph. D. degree, or its equivalent, evidence from the past of high ability and good character, and promise for the future from the opinions of men closely associated with him in scientific work, and the general nature of the problem submitted.

Applicants are permitted to select the institutions at which they may choose to work. Fellowships are awarded for a period of twelve months with a minimum stipend of $1800 for men without dependents. Fellows are expected to devote their entire time to research except that during the college year they may at their option give a portion of their time, in general not more than one-fifth, to teaching of educational value to themselves, or to attendance on advanced courses of study. Their results must be made available to the public without restriction.

Bakelite Fellowship: The Bakelite Corporation of New York has established at Northwestern University a Research Fellowship for studies on subjects related to the synthetic resin industry, which are more suitable for pure scientific treatment than for the ordinary technical investigation. The Fellowship carries a stipend of One Thousand Dollars. This position will be open February 1st, 1924. Application should be sent to W. Lee Lewis, Chairman Chemistry Department, Northwestern University, Evanston, Illinois.

Public Health Institute Fellowship: The Research Division of the Public Health Institute of Chicago has established at Northwestern University twelve Research Fellowships in the Organic Chemistry of Arsenic and Mercury. The Fellowships carry stipends of Five Hundred Dollars. Candidates with research experience may be awarded a somewhat larger amount. The

above positions will be open February 1st, 1924. Application should be sent to W. Lee Lewis, Chairman, Chemistry Department, Northwestern University, Evanston, Illinois.

Chemotherapy of Tuberculosis: A Fellowship carrying a five hundred dollar stipend is available at the University of Maryland for research on specifics in the treatment of tuberculosis. The chemical work will be in charge of Dr. M. S. Kharasch, Department of Chemistry, University of Maryland, College Park, Md.

American Chemist: The inspirational value of likenesses of the great hung upon the walls of laboratories and class rooms has long been recognized, and few schools indeed have been without their portraits of Lincoln, Washington, and Franklin. Yet our schools teaching chemistry have not had available, in proper form, portraits of our country's great chemists. Whenever one has desired these, one has been referred to foreign sources from which few portraits of Americans have been obtainable. To offset this circumstance as far as possible, Mr. D. H. Killeffer, Associate Editor of *Industrial & Engineering Chemistry*, has made a very careful selection of those Americans who have been most distinguished in the field of chemistry from the early days of the Republic to the present and has prepared these for publication in a form suitable for framing.

In selecting those who should be included the assistance of Drs. Edgar F. Smith, F. P. Venable, Julius Stieglitz, Chas. H. Herty, E. C. Franklin, C. A. Browne, William McPherson and Lyman C. Newell was asked and freely given. (It will be noted that five of these gentlemen have been presidents of the American Chemical Society.) For this reason it is believed that no better list could be prepared as representing American achievement in this field.

Portraits of the thirty-three gentlemen selected for inclusion have been procured and reproduced in the best manner of modern printing. The size of the portraits as finished is $4\frac{1}{4}$ by 6 inches on sheets which leave generous margins for framing. The portraits are each reproduced on separate sheets with the autograph of the subject and on alternate sheets appear brief sketches of the work of each. The whole is attractively bound in such a form that any or all may be removed.

In order to assure the publication of this work, advance subscriptions are being requested. Those interested are requested to communicate with Mr. Killeffer at 19 East 24th Street, New York.

The list of those whose portraits appear in this portfolio follows. Complete portfolios only are available and no selection of prints can be made.

Baekeland, L. H.	Langmuir, Irving
Bancroft, W. D.	Lewis, G. N.
Boltwood, B. B.	Mallett, J. W.
Booth, J. C.	Morley, E. W.
Chandler, C. F.	Noyes, A. A.
Chittenden, R. H.	Noyes, W. A.
Clarke, F. W.	Priestley, Joseph
Cottrell, F. G.	Remsen, Ira
Cooke, Josiah P.	Richards, T. W.
Franklin, E. C.	Rumford, Count
Gibbs, J. Willard	Silliman, Benjamin, Sr
Gibbs, Wolcott	Smith, Edgar F.
Gomberg, Moses	Smith, J. Lawrence
Hare, Robert	Stieglitz, Julius
Hillebrand, W. F.	Van Slyke, Donald D.
Hunt, T. Sterry	Whitney, W. R.
	Wiley, H. W.

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